

CLAIMS

1. A display apparatus comprising:

a sheet-form porous body which has plural holes dispersively formed to run through in a thickness direction thereof and has at least a light transmitting part to change its optical property in the thickness direction;

a liquid filled in each of the holes of the porous body, which has a light transmitting part and a part differing from the light transmitting part in optical property, the part differing in optical property being capable of changing its position in the thickness direction through voltage application thereto;

a pair of substrates of which at least one is transmissive of light and which hold the porous body on both sides thereof in the thickness direction so as to seal up the holes each filled with the liquid;

a transparent electrode disposed on one side of the pair of substrates; and

a counter electrode disposed on the other side of the pair of substrates, which enables electric field application to the liquid in the holes with the transparent electrode.

2. The display apparatus of claim 1, wherein the part of the liquid differing in optical property comprises fine particles dispersed in the liquid serving as a dispersant.

3. The display apparatus of claim 2, wherein the fine particles are formed of a light transmitting material internally containing at least one bubble.

4. The display apparatus of claim 1, wherein the part of the liquid differing in optical property comprises bubbles contained in the liquid.

5. The display apparatus of any one of claims 2 to 4, wherein the porous body has a colored part at least partly in the thickness direction thereof, and

when the position of the fine particles or the bubbles is set under field control so as to meet the position of the colored part, then the incident light to the light transmitting part is absorbed by the colored part, whereby the reflected light expresses coloration.

6. The display apparatus of claim 2, wherein the fine particles are white fine particles, and

when the position of the white fine particles is set under field control so as to meet the light transmitting part of the porous body, then the incident light to the light transmitting part is irregularly reflected on the surfaces of the white fine particles, whereby the reflected light expresses white.

7. The display apparatus of claim 3, when the position of the fine particles of the bubbles-containing light transmitting material is set under field control so as to meet the light transmitting part of the porous body, then the optical path of the incident light to the light transmitting part is changed owing to the refractivity difference from the light transmitting material or the liquid at the interface of the bubbles, whereby the reflected light expresses white.

8. The display apparatus of claim 4, when the position of the bubbles is set under field control so as to meet the light transmitting part of the porous body, then the optical path of the incident light to the light transmitting part is changed owing to the refractivity difference from the light transmitting material or the liquid at the interface of the bubbles, whereby the reflected light expresses white.

9. The display apparatus of claim 1 or 4, wherein the refractive index of the light transmitting part of the porous body is equivalent to that of the light transmitting part of the liquid, and the refractive index is at least 1.3.

10. The display apparatus of claim 3, wherein the refractive index of the light transmitting part of the porous body is

equivalent to that of the light transmitting material of the bubbles-containing fine particles, and the refractive index is at least 1.3.

11. The display apparatus of any one of claims 1 to 4, wherein the porous body comprises two layers composed of a light transmitting layer in contact with one of the substrates and a colored layer in contact with the other of the substrates.

12. The display apparatus of claim 11, wherein the holes formed in the porous body have a cylindrical form, running through the body from the surface of the light transmitting layer to the surface of the colored layer.

13. The display apparatus of claim 12, wherein a mean diameter of the cylindrical form is at most 100 μm .

14. The display apparatus of claim 11, wherein the colored layer of the porous body has a colored pattern of at least three periodically-repeating colors.

15. The display apparatus of any one of claims 1 to 4, wherein a mean diameter of the plural holes formed in the porous body is smaller than the thickness of the porous body.

16. The display apparatus of any one of claims 2 to 4, wherein the liquid to be filled in each hole of the porous body contains a plurality of the fine particles or the bubbles.

17. The display apparatus of claim 1, wherein the porous body and the pair of substrates contain an organic compound,
the transparent electrode and the counter electrode contain an electroconductive polymer, and
the apparatus is flexible as a whole.

18. The display apparatus of claim 1, wherein the light transmitting substrate on one side of the porous body is provided with a color filter.